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Assessment of knowledge and attitudes of physical education students about basic life support

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ABSTRACT

Aims: Sudden cardiac death in athletes can occur during training or competition. This study was conducted to assess the knowledge and attitudes of students from the faculty of sport sciences regarding basic life support (BLS) practices, emphasizing the importance of proper training in effectively responding to sudden cardiac arrest situations.

Methods: The study was conducted prospectively on students from the faculty of sport sciences. BLS knowledge was assessed using a questionnaire composed of two sections. The first section collected demographic data, while the second focused on sudden cardiac death and BLS practices.

Results: A total of 404 participated in the study. While 96.8% of students could recognize at least one indicator of sudden cardiac arrest, 3.2% could not identify any. Among participants, 85.9% knew how to perform chest compressions correctly, but only 56.7% identified the correct site, 18.6% knew the correct frequency, and 45.8% knew the correct compression depth. The proportion of students who correctly understood rescue breaths was 17.6%, while only 29.9% knew the correct compression-to-ventilation ratio. Additionally, 92.8% of students were unaware of the purpose of using an automated external defibrillator (AED). Overall, 75% of participants had previously received BLS training. Students with prior training demonstrated significantly better knowledge regarding pulse assessment duration, the definition and site of chest compressions, and AED usage compared to those without training ($p<0.05$). Similarly, students who had witnessed a sudden cardiac arrest scored significantly higher on questions related to chest compressions, hands-only CPR, and AED usage ($p<0.05$).

Conclusion: The results suggest that the knowledge level of sport sciences faculty students regarding BLS practices is inadequate. However, students with prior BLS training and those who have witnessed sudden cardiac arrest demonstrated higher levels of knowledge. It is recommended that sport sciences students receive regular BLS training to leverage their youth and dynamism for the benefit of public and athletic health.

Keywords: Sudden cardiac arrest, student, athlete, basic life support

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INTRODUCTION

Basic life support (BLS) or cardiopulmonary resuscitation (CPR) is a procedure performed on a person whose heart and/or breathing has stopped. It involves chest compressions to restore circulation and airway-opening maneuvers combined with rescue breaths to restore breathing, without the use of medications or medical equipment.[1,2] It has been demonstrated that early and effective chest compressions performed by a rescuer can significantly increase the victim's chances of survival in cases of sudden cardiac arrest.[3,4] Therefore, it is crucial for bystanders who witness sudden cardiac death to have sufficient knowledge of BLS practices.[1,5]

Sudden cardiac death in athletes is defined as a non-traumatic death occurring during or immediately after exercise, within six hours of previously normal health.[6,7] These deaths are often associated with cardiovascular diseases, with primary causes including hypertrophic cardiomyopathy, abnormal coronary artery anatomy, commotio cordis, and myocarditis.[8-10] Studies have shown that the incidence of sudden death in athletes ranges from 0.3 to 20 per 100000 annually, and it is more commonly observed in males than females.[11-13] It has also been noted that these rates vary depending on the type of sport and the athlete's age group. In

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the United States, basketball and American football are the sports most commonly associated with these deaths, while in Europe, football (soccer) is the leading sport.[14-16] The sudden death of a young person during a sports competition is a deeply tragic event for both the family and the community. Each year, social media and news outlets report cases of athletes losing their lives or narrowly escaping death during sports events (ESPN, Christian Eriksen-Discover Walk). One of the most notable examples of this was the sudden cardiac arrest suffered by Christian Eriksen during the 2021 European Football Championship. Considering the high number of active athletes worldwide, it becomes evident that not only healthcare professionals but also athletes and sports professionals must be equipped with knowledge and skills in BLS to prevent fatalities on the field.[17,18]

The aim of this study is to assess and evaluate the level of knowledge about BLS among students of the Faculty of Sport Sciences, emphasizing the importance of proper training. Additionally, it seeks to highlight the necessity of enhancing students' knowledge and skills to effectively respond to sudden deaths on sports fields.

METHODS

Ethics

The study was conducted with the permission of Kırıkkale University Faculty of Medicine Clinical Researches Ethics Committee (Date: 17.05.2016, Decision No: 2016-14/02). Informed consent was obtained from participants, and the study adhered strictly to the Helsinki Declaration and the Good Clinical Practice Guidelines throughout its execution.

Study Design

This study was conducted prospectively among students enrolled at the Faculty of Sport Sciences, Kırıkkale University. This study was designed as a cross-sectional diagnostic accuracy study.

Basic Life Support Questionnaire

The questions in the survey were prepared based on the American Heart Association (AHA) CPR Guidelines.[19] The questionnaire was developed by an expert who has conducted extensive research in the field of CPR. Incorrect choices were generated from common examples of clinical malpractice, common misinformation in the literature, and misinterpreted versions of relevant protocols. This method was chosen to objectively assess the level of knowledge and accuracy of the participants. Literature reviews and international guidelines (e.g., AHA) were taken into account in the study. This approach increases the methodological robustness of the study and has the potential to make important contributions to future research. The questionnaire consisted of two sections (Appendix-1):

First Section (Demographic Data): This section was designed to gather basic demographic information about the participants, including their age, years of sporting experience, gender, marital status, academic department, grade level, and sports branch. It comprised a total of 7 questions.

Second Section (BLS Knowledge): This section aimed to assess the participants' knowledge of BLS through 26 questions. The questions were distributed as follows:

- Questions 1 and 2: Inquired whether participants had received prior BLS training.
- Question 3: Assessed participants' recognition of sudden death indicators.
- Questions 4-6: Evaluated their knowledge of pulse assessment.
- Questions 7-10: Explored whether participants had ever witnessed a sudden death event.
- Questions 11-17: Assessed knowledge related to performing chest compressions (cardiac massage).
- Questions 18-21: Evaluated knowledge about rescue breathing (artificial respiration).
- Questions 22 and 23: Focused on the usage of an automated external defibrillator (AED).
- Question 24: Assessed knowledge about activating the emergency response system by dialing the appropriate number.
- Question 25: Asked participants to self-assess their level of knowledge about BLS.
- Question 26: Inquired whether participants were interested in attending a BLS course.

Evaluation of the Survey Questions

The survey questions were evaluated in different categories based on their characteristics. Questions 1, 7, 17, 18, and 26 were closed-ended questions answered with "yes/no". Questions 2, 3, 4, 8, 9, 10, 16, 19, 20, 21, and 23 were designed with multiple correct answers, aimed at assessing the distribution of knowledge levels in CPR. Questions 5, 6, 11, 12, 13, 14, 15, 22, and 24 were multiple-choice questions with only one correct answer. Question 25 asked participants to evaluate their own CPR knowledge level using a Likert scale ranging from "very insufficient" to "excellent." For the questions on recognizing sudden death symptoms and pulse assessment, each correct answer was assigned "1" point, and incorrect answers received "0" points. The minimum score for these questions was "0", and the maximum score was "6." An increase in the score (0 points="Does not know at all", 1-2 points="Low knowledge level", 3-4 points="Moderate knowledge level", 5-6 points="High knowledge level") indicated an improvement in CPR knowledge level.

Statistical Analysis

The data were analyzed using the SPSS 21.0 software (IBM SPSS Statistics 21.0, IBM Corporation, Armonk, NY, USA). Qualitative variables were expressed as frequency (n) and percentage (%), while quantitative variables were represented as mean and standard deviation (±SD). For the normality test of the data, the Kolmogorov-Smirnov test was used. To compare the groups, the Pearson Chi-square test was employed. A p-value <0.05 was considered statistically significant.

RESULTS

The study reached a total of 519 students. However, 94 students were excluded from the study due to incomplete survey forms, and 21 students who declined to participate

voluntarily were also removed. As a result, the study was completed with a final sample size of 404 students.

In Table 1, the majority of participants, 62.4%, are male. In terms of marital status, 98.8% of the participants are single. Regarding departmental distribution, physical education teaching (41.6%) and sports management (38.4%) stand out compared to the coaching and recreation departments. Based on class level, the highest percentage, 39.2%, belongs to the 2nd-year students. In terms of sport specialization, football is the most common sport at 17.6%, while 29.5% of participants have not yet selected a sport. This suggests that the study includes a young and newly introduced group of participants to sports.

Table 1. Demographic characteristics of participants

Gender	**(n=404)**
• Male, n (%)	252 (62.4)
• Female, n (%)	152 (37.6)
Marital status	
• Married, n (%)	5 (1.2)
• Single, n (%)	397 (98.8)
Department	
• Physical education teaching, n (%)	168 (41.6)
• Sports management, n (%)	155 (38.4)
• Coaching, n (%)	72 (17.8)
• Recreation, n (%)	9 (2.2)
Class	
• 1st year, n (%)	43 (10.6)
• 2nd year, n (%)	158 (39.2)
• 3rd year, n (%)	98 (24.3)
• 4th year, n (%)	105 (25.9)
Sport specialization	
• Football, n (%)	71 (17.6)
• Swimming, n (%)	52 (12.9)
• Badminton, n (%)	40 (9.9)
• Athletics, n (%)	27 (6.7)
• Volleyball, n (%)	25 (6.2)
• Basketball, n (%)	17 (4.2)
• Gymnastics, n (%)	10 (2.5)
• Other sports, n (%)	43 (10.6)
• No sport specialization yet, n (%)	119 (29.5)

In Table 2, 75% of the participants have previously received BLS training, with the majority of them (77.2%) having received this training at the faculty. The participants demonstrated recognition of signs of sudden death, with the most commonly identified signs being the absence of pulse, cessation of breathing, loss of consciousness, and lack of verbal response. Regarding their level of knowledge on recognizing sudden death signs, 44.8% were found to have a high level of knowledge. In the case of sudden death, the most frequently chosen site for pulse evaluation was the carotid artery (78.6%), and for pulse evaluation duration, 36.4% of participants selected 60 seconds. However, only 19.3% of the participants correctly identified the "10 seconds" response as the correct pulse evaluation time.

The proportion of participants who correctly knew how to perform CPR was 86.4%. The correct location for performing effective CPR, which was identified as the "center of the sternum," was chosen by 57.7% of the students. Only 18.6% of the participants knew the correct number of chest

Table 2. Evaluation of CPR knowledge

Have you previously received CPR training? (n=404)	
• Yes, n (%)	303 (75.0)
• No, n (%)	101 (25.0)
Where was CPR training received? (n=303)	
• Faculty, n (%)	234 (77.2)
• Driver's license course, n (%)	106 (34.9)
• First aid book, n (%)	23 (7.6)
• Visual media (TV, internet), n (%)	15 (4.9)
• Health worker friend, n (%)	9 (2.9)
• Received training from multiple sources, n (%)	64 (21.1)
Recognizing signs of sudden death (n=404)	
• No pulse, n (%)	354 (87.6)
• No breathing, n (%)	327 (80.9)
• Loss of consciousness, n (%)	266 (65.8)
• No verbal response, n (%)	183 (45.2)
• Chest pain, n (%)	17 (4.1)
• Nausea or vomiting, n (%)	17 (4.1)
Knowledge level in recognizing signs of sudden death (n=404)*	
• Do not know at all (0 points), n (%)	13 (3.2)
• Insufficient (1-2 points), n (%)	75 (18.7)
• Moderate (3-4 points), n (%)	135 (33.4)
• High (5-6 points), n (%)	181 (44.8)
Pulse assessment location in the event of sudden death (n=404)	
• Carotid artery, n (%)	318 (78.6)
• Radial artery, n (%)	240 (59.4)
• Femoral artery, n (%)	8 (1.9)
• I don't know, n (%)	22 (5.4)
Time taken for pulse assessment in the event of sudden death (n=404)	
• 1 second, n (%)	17 (4.2)
• 10 seconds, n (%)	78 (19.3)
• 30 seconds, n (%)	89 (22.1)
• 60 seconds, n (%)	147 (36.4)
• Until the pulse is detected, n (%)	22 (5.4)
• I don't know, n (%)	51 (12.6)

*Each correct answer to the question on recognizing the symptoms of sudden death was given a score of "1" and each incorrect answer was given a score of "0" (0 points, "not at all familiar", 1-2 points, "low level of knowledge", 3-4 points, "moderate level of knowledge", 5-6 points, "high level of knowledge"). CPR: Cardiopulmonary resuscitation

compressions for hands-only CPR, while 29.9% knew the correct chest compression-to-breath ratio. Additionally, 45.8% of participants were aware of how much pressure should be applied to the chest wall during CPR. Regarding the potential harms of CPR, 87.9% of participants stated that CPR could be harmful, and 74.8% believed that it most commonly leads to "rib fractures" (Table 3).

Of the participants, 24.1% had performed CPR before, and 35.1% had performed this intervention on a family member. Among those who did not perform CPR, 17.6% did not perform CPR because they "did not know the correct technique", 63.1% did not perform CPR because they had never encountered such a situation, 7.5% did not perform CPR because of feeling of disgust and 2.2% because of the risk of infectious diseases. The most common rescue breathing technique was "mouth-to-mouth breathing" by 64.9% (Table 4).

According to the knowledge of the AED, only 10.4% of the students correctly knew the purpose of using the AED. However, it was believed that this device is most commonly

Table 3. Evaluation of CPR knowledge

What is CPR? (n=404)	
• Pressing on the chest wall at regular intervals, n (%)	349 (86.4)
• Compressing the heart by opening the chest wall, n (%)	28 (6.9)
• Applying an electrical shock to the chest wall, n (%)	14 (3.5)
• I don't know, n (%)	13 (3.2)
What is the correct location for performing CPR? (n=404)	
• The center of the chest wall, n (%)	233 (57.7)
• The left side of the chest wall, n (%)	123 (30.4)
• The right side of the chest wall, n (%)	17 (4.2)
• I don't know, n (%)	31 (7.6)
How many times per minute should hands-only CPR be performed? (n=404)	
• 10 times per minute, n (%)	115 (28.5)
• 50 times per minute, n (%)	106 (26.2)
• More than 100 times per minute, n (%)	75 (18.6)
• I don't know, n (%)	108 (26.7)
How much pressure should be applied to the chest wall during CPR? (n=404)	
• 1-2 cm, n (%)	145 (35.9)
• 5-6 cm, n (%)	185 (45.8)
• 7-10 cm, n (%)	30 (7.4)
• I don't know, n (%)	44 (10.8)
What should the ratio of chest compressions to breaths be during CPR? (n=404)	
• 5/1, n (%)	93 (23.1)
• 15/1, n (%)	32 (7.9)
• 15/2, n (%)	41 (10.1)
• 30/1, n (%)	19 (4.7)
• 30/2, n (%)	121 (29.9)
• I don't know, n (%)	98 (24.2)
Is CPR harmful? (n=404)	
• Yes, n (%)	355 (87.9)
• No, n (%)	13 (3.2)
• I don't know, n (%)	36 (8.9)
What are the potential harms of CPR? (n=404)	
• It could stop the heart, n (%)	160 (39.6)
• The heart could be injured, n (%)	141 (13.9)
• The ribs could break, n (%)	302 (74.8)
• The stomach could be injured, n (%)	71 (17.3)
• The lungs could be injured, n (%)	76 (18.8)
• I don't know, n (%)	37 (9.2)

CPR: Cardiopulmonary resuscitation

Table 4. Evaluation of rescuer breathing knowledge

Have you ever performed artificial respiration? (n=404)	
• Yes, n (%)	97 (24.1)
• No, n (%)	307 (75.9)
Who did you perform artificial respiration on? (n=97)	
• Family member, n (%)	34 (35.1)
• Friend/acquaintance, n (%)	22 (22.7)
• Athlete, n (%)	11 (11.3)
• Stranger (unknown person), n (%)	30 (30.9)
Why didn't you perform artificial respiration? (n=307)	
• I have not encountered such a situation, n (%)	194 (63.1)
• I didn't do it because I didn't know how, n (%)	54 (17.6)
• I didn't do it because I didn't know the person, n (%)	19 (6.2)
• I didn't do it because I was disgusted (blood, vomit, etc.), n (%)	23 (7.5)
• I didn't do it due to fear of infectious disease risk, n (%)	7 (2.2)
• I didn't do it for multiple reasons, n (%)	48 (15.6)
What techniques can be used to perform artificial respiration? (n=404)	
• Mouth-to-mouth, n (%)	262 (64.9)
• Mouth-to-nose, n (%)	9 (2.2)
• Mouth-to-both mouth and nose, n (%)	26 (6.4)
•All methods can be used, n (%)	81 (20.1)
• I don't know, n (%)	26 (6.4)

Table 5. Automated external defibrillator (AED) knowledge evaluation

When is an AED used? (n=404)	
• It is used to correct life-threatening heart rhythms, n (%)	47 (10.4)
• It is used when the heart stops and there is no pulse, n (%)	270 (66.8)
• It is used when respiration stops and the patient is not breathing, n (%)	42 (9.9)
• I don't know, n (%)	45 (10.1)
Where can the AED be found?(n=404)	
• Emergency room, n (%)	377 (93.3)
• Ambulance, n (%)	348 (86.1)
• Other (e.g., olympic village, cinema, theater, shopping mall), n (%)	19 (4.5)
• I don't know, n (%)	13 (3.2)

found in emergency rooms (93.3%) and ambulances (86.1%) (Table 5).

Witnessing Sudden Death: The percentage of participants who have witnessed a sudden death before is 26.2%, with 31.1% having experienced it with family members and 33.9% with strangers. The most common locations for these incidents were the home (35.8%) and the street (33.1%). Among those who responded to a sudden death situation, 33.1% called an ambulance, while 23.5% reported that they did nothing due to shock. Despite having CPR knowledge, 11.3% could not intervene, and 12.2% performed CPR (Table 6).

It was observed that those who had previously received CPR training had significantly higher rates of correct answers to the questions on "pulse evaluation time, definition and application location of CPR, and the purpose of using AED" compared to those who had not received training ($p<0.001$; 0.026; 0.011; 0.037, respectively) (Table 7).

It was observed that those who had not previously witnessed sudden death had a significantly higher correct answer rate for the questions about 'hands-only CPR and the purpose of using an AED' compared to those who had witnessed sudden death. On the other hand, the definition of CPR was found to be significantly higher among those who had witnessed sudden death ($p=0.001$; 0.001; 0.013, respectively) (Table 8).

DISCUSSION

The aim of this study is to determine and evaluate the BLS knowledge level of students in the faculty of sports sciences. This is particularly important because students in this field may face situations of sudden respiratory arrest on sports fields, or physical education teachers may need to perform BLS in school settings. Therefore, it is crucial for students

Table 6. Distribution of those who witnessed sudden death

Did you witness his sudden death? (n=404)	
• Yes, n (%)	106 (26.2)
• No, n (%)	298 (73.8)
The distribution of individuals who have witnessed a sudden death (n=106)	
• Family member, n (%)	33 (31.1)
• Friend, n (%)	13 (12.2)
• Acquaintance (neighbor or relative), n (%)	24 (22.6)
• Stranger, n (%)	36 (33.9)
The distribution of the locations where individuals have witnessed a sudden death (n=106)	
• Home, n (%)	38 (35.8)
• School or sports hall, n (%)	7 (6.5)
• Workplace, n (%)	7 (6.5)
• Street, n (%)	35 (33.1)
• Seaside, n (%)	7 (6.5)
• Forest or picnic area, n (%)	3 (2.8)
• Hospital, n (%)	9 (8.4)
The response to a sudden death situation (n=106)*	
• I was in shock, i couldn't do anything, n (%)	25 (23.5)
• I couldn't do anything because i didn't know CPR, n (%)	15 (14.1)
• Even though i knew CPR, i couldn't do anything, n (%)	12 (11.3)
• I asked people around for help, n (%)	13 (12.2)
• I called an ambulance (112), n (%)	35 (33.1)
• I checked the pulse, n (%)	22 (20.7)
• I checked the breathing, n (%)	16 (15.1)
• I performed CPR, n (%)	13 (12.2)

*Reaction to sudden death; more than one answer was given, CPR: Cardiopulmonary resuscitation

in the faculty of sports sciences to have knowledge of BLS procedures.

It was found that the majority of students had previously received BLS training, which was provided during their education at the faculty. The students were familiar with signs of sudden death, such as the inability to detect a pulse, respiratory arrest, loss of consciousness, and lack of verbal response. About half of the students had a high level of knowledge regarding recognizing symptoms of sudden death. However, the correct response rate for detecting the pulse during sudden death was only about a quarter, which is relatively low. This finding indicates that while students have general knowledge about BLS and sudden death interventions, there are gaps in their practical knowledge. Hırça[20] emphasized these gaps and suggested that BLS training should be compulsory and regularly provided in teacher-training schools.

The knowledge level regarding how to perform chest compressions was found to be high. More than half of the students correctly identified the "midline of the sternum" as the appropriate point for chest compressions. However, the percentage of students who knew the correct number of chest compressions or the correct ratio of compressions to breaths was lower. Around half of the participants knew how much pressure should be applied to the chest wall during CPR. Additionally, a high percentage of students expressed concerns about potential harm from chest compressions, particularly rib fractures. These findings suggest that while students possess some basic knowledge about chest compressions, certain key details need to be emphasized

Table 7. Comparison of the correct answer rates of those who received and those who did not receive combined repercussion therapy training

	Trained (n=303)	Non-trained (n=101)	p
• What are the signs of sudden death? (n, %)	296 (97.7)	95 (94.1)	0.109
• Where should the pulse be checked in the case of sudden death? (n, %)	297 (98.1)	90 (89.1)	<0.001
• How long should pulse checking last in the case of sudden death? (n, %)	52 (17.2)	24 (23.8)	0.293
• What is CPR (cardiopulmonary resuscitation)? (n, %)	267 (88.1)	80 (79.2)	0.026
• Where is the correct location for CPR? (n, %)	185 (61.1)	47 (46.5)	0.011
• How many compressions should be performed during hands-only CPR? (n, %)	58 (19.1)	15 (14.8)	0.521
• How deep should chest compressions be during CPR? (n, %)	27 (8.9)	4 (3.9)	0.105
• What is the ratio of chest compressions to breaths during CPR? (n, %)	97 (32.1)	4 (3.9)	0.117
• What are the techniques for performing rescue breathing? (n, %)	283 (93.4)	92 (91.1)	0.436
• In which situations is an automated external defibrillator (AED) used? (n, %)	147 (48.5)	38 (37.6)	0.037
• Where can an AED be found? (n, %)	232 (76.6)	78 (77.2)	0.909

Table 8. Comparison of correct answer rates between those who have witnessed sudden death (WSD) and those who have not

	WSD (n=106)	No WSD (n=298)	p
• What are the signs of sudden death?, n (%)	101 (95.3)	290 (97.3)	0.394
• Where should the pulse be checked in the event of sudden death?, n (%)	74 (69.8)	236 (79.2)	0.121
• How long should the pulse be checked during sudden death?, n (%)	19 (17.9)	57 (19.1)	0.803
• What is CPR (cardiopulmonary resuscitation)?, n (%)	78 (73.6)	269 (90.3)	0.001
• Where is the correct place to perform CPR?, n (%)	60 (56.6)	172 (57.7)	0.842
• How many compressions should be done in hands-only CPR?, n (%)	38 (35.8)	35 (11.7)	0.001
• How deep should chest compressions be during CPR?, n (%)	54 (50.9)	131 (43.9)	0.215
• What is the ratio of chest compressions to breaths during CPR?, n (%)	38 (35.8)	83 (27.8)	0.123
• What are the techniques for performing rescue breathing?, n (%)	95 (89.6)	280 (93.9)	0.137
• In which situations is an automated external defibrillator (AED) used?, n (%)	14 (13.2)	17 (5.7)	0.013
• Where can an automated external defibrillator (AED) be found?, n (%)	99 (93.4)	288 (96.6)	0.139

more. Bohn et al.[21] found that even 10-year-old children could perform chest compressions as effectively as adults.

About a quarter of the participants had previously performed mouth-to-mouth resuscitation, and about one-third had performed it on a family member. Those who had not performed mouth-to-mouth resuscitation either did not know the correct technique or had never encountered such situations. Some students refrained from performing mouth-to-mouth resuscitation due to disgust or fear of infectious diseases. The most well-known technique was "mouth-to-mouth breathing". These findings indicate that the majority of students lack practical experience, and their knowledge of the techniques needs to be further developed. Casa et al.[22] argue that since coaches are often responsible for such interventions in schools, all coaches should be trained in CPR and AED use. Priyangika et al.[23] advocated for the inclusion of first aid in school curricula.

When evaluating knowledge of AED use, only a small proportion of participants correctly identified its purpose. The majority of participants believed AEDs were used when the heart stopped and there was no pulse. However, there was a noticeable lack of awareness regarding the availability of AEDs in public spaces, such as shopping malls. This indicates the need for more education regarding the function and accessibility of AEDs. Kramer et al.[24] noted that the majority of public participants were unaware of AEDs, and Johnson et al.[25] reported that only 11% of schools had implemented the necessary emergency action plans.

The percentage of participants who had witnessed sudden death was generally low, but those who had experienced it typically encountered it in family settings or in public spaces. Most participants who witnessed sudden death called for an ambulance, while some were unable to intervene due to the shock of the event. The proportion of participants with BLS knowledge who did not intervene was low. These findings suggest that individuals' response capacity in sudden death situations needs to be enhanced, and more effective training programs are needed to improve intervention skills.

A comparison of the correct response rates of students who had received BLS training and those who had not showed that those who had received training generally performed better, particularly in questions like "where should the pulse be checked during sudden death?" and "what is chest compression?". However, there were no significant differences between the two groups in some other areas (e.g., how many chest compressions should be performed in hands-only CPR?). These results indicate that BLS training is particularly effective in critical areas of knowledge, but the content of the training should be enhanced in some areas.

Studies by Al-Turki et al.[26], Almesned et al.[27], Al-Turkistani[28], Suri et al.[29] and Kara et al.[30] have shown that university students and the general public lack knowledge of BLS, though their attitudes toward it are generally positive. These findings support the need for widespread BLS training and ongoing education programs.

CONCLUSION

As a result, this study found that students were able to recognize symptoms of sudden death, such as the inability to detect a pulse, cessation of breathing, loss of consciousness, and lack of verbal response. While the students possessed general knowledge of BLS and sudden death interventions, it was observed that there were notable gaps in their knowledge. A significant portion of students accurately understood how to perform CPR, including the correct location for effective chest compressions, with most students identifying the "sternum center" as the right point. However, the proportion of students who correctly knew the number of chest compressions required, as well as the chest compression/ventilation ratio, was low. Additionally, nearly half of the students correctly identified the appropriate depth of chest compression during CPR, but there was a significant lack of knowledge regarding the proper number of chest compressions and the correct chest compression/ventilation ratio.

Only a small portion of the students had ever performed artificial respiration, and most of them had administered it to family members. Those who did not perform artificial respiration either lacked knowledge of the proper technique or had never encountered a situation requiring it. A few students were also reluctant to perform artificial respiration due to a sense of disgust or the fear of contagious diseases. It was found that the majority of students lacked practical experience. In terms of the use of the AED, students thought it was only used in emergency services and ambulances, and many were unaware of its availability in other public spaces, such as shopping malls.

Students who had received BLS training generally showed a higher level of knowledge compared to those who had not. However, it was observed that those who had witnessed sudden death incidents had lower levels of knowledge compared to those who had not. This highlights the importance of hands-on experience in learning, suggesting that knowledge acquired through real-life experience plays a critical role in the effectiveness of BLS interventions.

These findings underscore the need for ongoing and updated BLS training programs, which should not only provide theoretical knowledge but also emphasize practical experience. BLS education should be tailored to current needs, ensuring that students not only acquire knowledge but also gain hands-on practice. Additionally, such training programs should be consistent, widely accessible, and continuously improved to keep up with the evolving requirements of modern-day emergencies.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was conducted with the permission of Kırıkkale University Faculty of Medicine Clinical Researches Ethics Committee (Date: 17.05.2016, Decision No: 2016-14/02).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Nolan JP, Soar J, Zideman DA, et al. European resuscitation council guidelines for resuscitation 2010 section 1. Executive summary. *Resuscitation*. 2010;81(10):1219-1276. doi:10.1016/j.resuscitation.2010.08.021
2. Mutie M, Cooper G, Kyle G, Naunton M, Zwar N. Travelling with medications and medical equipment across international borders. *Travel Med Infect Dis*. 2014;12(5):505-510. doi:10.1016/j.tmaid.2014.07.007
3. Berdowski J, Blom MT, Bardai A, Tan HL, Tijssen JG, Koster RW. Impact of onsite or dispatched automated external defibrillator use on survival after out-of-hospital cardiac arrest. *Circulation*. 2011;124(20):2225-2232. doi:10.1161/CIRCULATIONAHA.110.015545
4. McNally B, Robb R, Mehta M, et al. Out-of-hospital cardiac arrest surveillance---cardiac arrest registry to enhance survival (CARES), United States, October 1, 2005--December 31, 2010. *MMWR Surveill Summ*. 2011;60(8):1-19.
5. Jarrah S, Judeh M, AbuRuz ME. Evaluation of public awareness, knowledge and attitudes towards basic life support: a cross-sectional study. *BMC Emerg Med*. 2018;18(1):37. doi:10.1186/s12873-018-0190-5
6. Drezner JA. Sudden cardiac death in young athletes. Causes, athlete's heart, and screening guidelines. *Postgrad Med*. 2000;108(5):37-50. doi:10.3810/pgm.2000.10.1260
7. Kochi AN, Vettor G, Dessanai MA, Pizzamiglio F, Tondo C. Sudden cardiac death in athletes: from the basics to the practical work-up. *Medicina (Kaunas)*. 2021;57(2):168. doi:10.3390/medicina57020168
8. Markwerth P, Bajanowski T, Tzimas I, Dettmeyer R. Sudden cardiac death-update. *Int J Legal Med*. 2021;135(2):483-495. doi:10.1007/s00414-020-02481-z
9. Maron BJ, Doerer JJ, Haas TS, Tierney DM, Mueller FO. Sudden deaths in young competitive athletes: analysis of 1866 deaths in the United States, 1980–2006. *Circulation*. 2009;119(8):1085-1092. doi:10.1161/CIRCULATIONAHA.108.804617
10. Turhan E, Akpinar B, Duruöz A. Okulda temel yaşam desteği eğitimi alan öğretmenlerin bilgileri ve uygulamaları üzerine bir araştırma. *Hacettepe Sağlık İletişimi Dergisi*. 2015;2(1):1-8.
11. Meyer L, Stubbs B, Fahrenbruch C, et al. Incidence, causes, and survival trends from cardiovascular-related sudden cardiac arrest in children and young adults 0 to 35 years of age: a 30-year review. *Circulation*. 2012;126(11):1363-1372. doi:10.1161/CIRCULATIONAHA.111.076810
12. Corrado D, Pellicia A, Bjørnstad HH, et al. Cardiovascular pre-participation screening of young competitive athletes: proposal for a common European protocol. *Eur Heart J*. 2005;26(5):516-524. doi:10.1093/eurheartj/ehi108
13. Harmon KG, Asif IM, Maleszewski JJ, et al. Incidence, cause, and comparative frequency of sudden cardiac death in National Collegiate Athletic Association athletes: a decade in review. *Circulation*. 2015;132(1):10-19. doi:10.1161/CIRCULATIONAHA.115.015431
14. Gilchrist S, Schieb L, Mukhtar Q, et al. A summary of public access defibrillation laws, United States, 2010. *Prev Chronic Dis*. 2012;9:110196. doi:10.5888/pcd9.110196
15. Link MS, Atkins D, Passman R, et al. Part 6: electrical therapies: automated external defibrillators, defibrillation, cardioversion, and pacing: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation*. 2010;122(18 Suppl 3):S706-S719. doi:10.1161/CIRCULATIONAHA.110.970954
16. Marijon E, Tafflet M, Celermajer DS, et al. Sports-related sudden death in the general population. *Circulation*. 2011;124(6):672-681. doi:10.1161/CIRCULATIONAHA.110.008979
17. Graham CA, Scallon D. Cardiopulmonary resuscitation training for undergraduate medical students: a five-year study. *Med Educ*. 2002;36(3):296-298. doi:10.1046/j.1365-2923.2002.01154.x
18. Moesch K, Kenttä G, Kleinert J, Quignon-Fleuret C, Cecil S, Bertollo M. FEPSAC position statement: mental health disorders in elite athletes and models of service provision. *Psychol Sport Exercise*. 2018;38:61-71. doi:10.1016/j.psychsport.2018.05.013
19. Hazinski MF, Field JM. 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care science. *Circulation*. 2010;122(Suppl):S639-S946.
20. Hırça N. Does teachers' knowledge meet first aid needs of Turkish schools? Review of Turkish Literature. *J Eur Educ*. 2012;2(2):16-23.
21. Bohn A, Van Aken HK, Möllhoff T. Teaching resuscitation in schools: annual tuition by trained teachers is effective starting at age 10. *Resuscitation*. 2012;83(5):619-625. doi:10.1016/j.resuscitation.2012.01.020
22. Casa DJ, Almquist J, Anderson SA, et al. The inter-association task force for preventing sudden death in secondary school athletics programs: best-practice recommendations. *J Athl Train*. 2013;48(4):546-553. doi:10.4085/1062-6050-48.4.12
23. Wilks J, Pendergast D. Skills for life: first aid and cardiopulmonary resuscitation in schools. *Health Educ J*.2017;76(8):1009-1023. doi:10.1177/0017896917728096
24. Kramer EB, Botha M, Drezner J, Abdelrahman Y, Dvorak J. Practical management of sudden cardiac arrest on the football field. *Br J Sports Med*. 2012;46(16):1094-1096. doi:10.1136/bjsports-2012-091376
25. Johnson ST, Norcross MF, Bovbjerg VE, Hoffman MA, Chang E, Koester MC. Sports-related emergency preparedness in oregon high schools. *Sports Health*. 2017;9(2):181-184. doi:10.1177/1941738116686678
26. Al-Turki YA, Al-Fraih YS, Jalaly JB, et al. Knowledge and attitudes towards cardiopulmonary resuscitation among university students in Riyadh, Saudi Arabia. *Saudi Med J*. 2008;29(9):1306-1309.
27. Almesned A, Almeman A, Alakhtar AM, et al. Basic life support knowledge of health care students and professionals in the Qassim University. *Int J Health Sci (Qassim)*. 2014;8(2):141-150. doi:10.12816/0006080
28. Al-Turkistani HK. Awareness and knowledge of pediatric cardiopulmonary resuscitation in the community of Al-Khobar city. *J Family Community Med*. 2014;21(2):125-129. doi:10.4103/2230-8229.134772
29. Abolfotouh MA, Alnasser MA, Berhanu AN, Al-Turaif DA, Alfayez AI. Impact of basic life-support training on the attitudes of health-care workers toward cardiopulmonary resuscitation and defibrillation. *BMC Health Serv Res*. 2017;17(1):674. doi:10.1186/s12913-017-2621-5
30. Kara F, Yurdakul A, Erdoğan B, Polat E. Bir devlet hastanesinde görev yapan hemşirelerin güncel temel yaşam desteği bilgilerinin değerlendirilmesi. *MAKÜ Sag Bil Enst Derg*. 2015;3(1):17-26.